Inchon Release Notes

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This is the "Release Notes" document associated with the Inchon release. This document is available in PDF format at http://www.gfdl.noaa.gov/~fms/inchon/inchon.pdf.

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1. Inchon Release Schedule

Table 1. Release Schedule

Date	**Action**
Jan. 22, 2003	FMS Developers Meeting, code proposals finalized
Feb. 24, 2003	All code changes submitted, final testing begins
April 9, 2003	Release Date

2. Inchon Overview

This release contains versions of mom4, the bgrid atmospheric core, and the spectral atmospheric core that are modified in preparation for public release. This is the first city release to distribute the RTS, our new Regression Test Suite, and the first city release to include and test versions of OM2, CM2, and SCM (the Single Column Model).

A few other highlights of Inchon include the new data_override functionality, a spherical regrid scheme in horiz_interp, a second order conservative remapping scheme for exchange grids, and a cross-ensemble parallelization checking tool for the coupler. AM2-series development through AM2p11 is included.

3. Acquiring Inchon Code

Here is a list of cvs checkout commands for available models. For help on using cvs, see the Guide to CVS [http://www.gfdl.noaa.gov/~fms/cvsinfo.html].

```
#the $CVSROOT environment variable should point to the FMS CVS repository
setenv CVSROOT /home/fms/cvs

cvs co -r inchon fms_bgrid_am2
cvs co -r inchon fms_spectral_am2
cvs co -r inchon fms_spectral_2layer_mixed
cvs co -r inchon fms_spectral_2layer_amip
cvs co -r inchon fms_bgrid_solo
cvs co -r inchon fms_spectral_solo
cvs co -r inchon fms_spectral_mixed_layer
cvs co -r inchon fms_bgrid_mixed_layer
cvs co -r inchon fms_scm_astex
cvs co -r inchon fms_scm_arm
cvs co -r inchon mom4
cvs co -r inchon fms_standalone_rad
cvs co -r inchon fms_spectral_barotropic
cvs co -r inchon fms_spectral_shallow
```

One can also acquire Inchon code as well as scripts through the RTS. The following will check out an xml file containing a set of default models.

```
cvs co -r inchon rts
#if you want to rename the rts/rts.xml file, try
cvs co -p -r inchon rts/rts.xml > inchon.xml
```

All experiments in the rts.xml file have passed the RTS reproducibility tests. Runs are available for reference in `/home/fms/inchon`. Usage information for RTS is available at http://www.gfdl.gov/~arl/rts/.

4. Inchon Release Notes

4.1. Bgrid Atmospheric Core

- polar filtering using mpp_redistribute
- namelist changes
- netcdf restart option
- efficiency improvements

Answers change due to order-of-operations modifications. (bw)

4.2. Spectral Atmospheric Core

- Option for multiple dynamics time steps per physics time step removed. This problem should be revisited because the physics is very costly in am2p10.
- Subwindow option removed. Testing reveals that the memory savings is trivial. The way this option was implemented in havana harms performance. To code it without harming performance complicates the code.
- Shared vertical advection module is used.
- Fully implemented the tracer manager and field_table. Water vapor is now a tracer.
- A number of namelist variables converted from type integer to character.
- Option to read topography as netcdf data.
- Added option to specify the robert coefficient for tracers.
- Fixed bugs that were manifested when fourier_inc > 1

- Removed use of utilities_mod. Uses fms_mod instead.
- Added radius to calling args of transforms_init, instead of using radius from constants_mod.
- Two new spectral atmospheric cores: spectral_barotropic and spectral_shallow.

(pjp)

4.3. AM2p11

AM2-series code through AM2p11 is included. See the Model Development Database [http://linux1.gfdl.gov/~lat/database/db_index.html] for more details.

The bilinear interpolation namelist parameter of `ice_amip/ice_model` and `ocean_amip/ocean_model` is changed to `interp_method="bilinear"` or `interp_method="conservative"`. See Section 4.7.1 below for more details.

4.4. Atmospheric Parameterizations

4.4.1. AM3-related changes

- Cleanup to cg_drag
- AM3 physics interaction
- Cleanup of donner_deep.f90
- Changes to mpp_clock interface
- Modify intent(out) for derived types
- Define pointer association status upon allocation
- Mods needed because of syntax issues on other platforms
- Nullify pointer elements of derived type variables on declaration
- Bugfix in monin_obukhov

4.4.2. RAS

Tracers are added to RAS. (wfc)

4.4.3. mg_drag

mg_drag.f90 reads topography variance as netcdf data. This corrects a bug. In havana, one could not use computed topography and specicied topography variance at the same time. Changed default method of obtaining subgrid scale topography variance. Default is now to read it instead of computing it. (pjp)

4.4.4. New Entrain Module

New boundary layer scheme. (sak)

4.5. Shared Atmospheric Code

4.5.1. Vertical Advection

Modified vert_advection.f90 for compatability with spectral model. (pjp)

Performance improvements. (bw)

4.5.2. Interpolator

The module `atmos_param/sea_esf_rad/interpolater.f90` has been moved and renamed to `atmos_shared/interpolator/interpolator.f90`.

Added a 2D version of the interpolator so that it can be used with emission fields. Added a query_interpolator routine which allows querying of number of field_names in the climatology type and also the field_names.

4.6. MOM4

Redefined nearly all of the MOM interfaces from Havana code. Interface to coupler_main.f90 for "solo" and "coupled" runs. Fluxes and flux inputs for solo runs are provided via data_override. Added river mixing scheme. Updates to neutral physics for closure schemes. Updates to lateral Smagorinsky viscosity to emulate NCAR version. Bugfix for quicker algorithm with tripolar grid. Static memory option for performance increase on HPCS. (mh2, smg)

4.7. Shared Code

4.7.1. horiz_interp

Added the spherical regrid scheme to remap from tripolar grid to tripolar grid. Changed the optional logical argument in horiz_interp_init to optional string argument interp_method: `interp_method="conservative"` (conservative scheme, remap from rectangular to rectangular grid), `interp_method="bilinear"` (bilinear interpolation, remap from rectangular grid to any grid), `interp_method="spherical"` (spherical regrid, from any grid to any grid). When source grid is 1d, default value of interp_method is `"conservative"`. (z1l)

4.7.2. tracer_manager, field_manager

In the field manager, added the capability to simply have a field method named without needing to define a method type or method control. This requires that a default method type, and control if necessary, be coded in the user code inquiring for the field method.

In atmos_tracer_driver, added arguments to atmos_tracer_driver (dt, z_half, z_full, t_surf_rad, albedo, coszen, Time_next). Added phalf to argument list to atmos_tracer_driver_init. In atmos_tracer_utilities, aded a couple of parameters mw_air, Navo. Added diag fields to allow partitioning of wet deposition between convective and large scale processes. Added capability to read dry deposition velocities from a file. Added capability for differentiating between mass mixing ratios (mmr) and volume mixing ratios (vmr) for diagnostic output. Added dt to argument list for wet_deposition. This is necessary so that you can calculate an asymptotic value for removal.

In the tracer manager, a routine is added to query the initialization status of tracers. tracer_requires_init should be called from the model core if a restart file is not found. This sets a flag in the tracer_type which can be queried by (function) query_tracer_init in the tracer_init routine. (wfc)

4.7.3. New data_override Module

Given a gridname, fieldname and model time this routine will get data in a file whose path is described in a user-provided data_table, do spatial and temporal interpolation if necessary to convert data to model's grid and time.

Before using data_override a data_table must be created with the following entries: gridname, fieldname_code, fieldname_file, file_name, ongrid, factor. More explanation about data_table entries can be found in the source code (defining data_type).

If user wants to override fieldname_code with a constant, the data_table should set `fieldname_file = ""` and `factor = constant`. If user wants to override fieldname_code with data from a file, set `fieldname_file = name` in

the netCDF data file, `factor` then will be for unit conversion (=1 if no conversion required).

A field can be overriden globally (by default) or users can specify a region in which data_override will take place. Field values outside the region will not be affected. Initialization can be done more than once for concurrency/ensembles. (gtn)

4.7.4. fms_io

An optional argument `append_pelist_name` in read_data and write_data allows fms_io to work in concurrent runs. (gtn)

4.7.5. time_interp_external

Monthly data's timestamp is now the first of the month instead of middle of month, so it changes answers in this sense. (gtn)

4.7.6. MPP

Performance Improvements. (vb)

4.7.7. Exchange Grid

A second order conservative remapping scheme is available. To use the higher remapping scheme, set `using_higher_order=.true.` in `xgrid_nml` and `remap_order=2` in `flux_exchange_nml`. The default scheme is linear order remapping.

Compatible with cross-ensemble parallelization checking. New namelist parameter for verbosity; to print debugging information, set `debug=.true.` in `xgrid_nml`. (z1l)

4.7.8. Constants

The modules `mom4/ocean_core/ocean_constants.f90` and `sea_esf_rad/constants_new.f90` have been merged into `shared/constants/constants.f90`. This required some name and value changes. `GRAV` is now 9.8, causing answers to change in mom4 models. `RADIUS` is now 6371.e3, causing answers to change in the atmospheric models. `CP` has become `CP_AIR` and `CP_OCEAN`. `PI` is now computed in constants_init, which is called from each main program after the call to fms_init. `RADIAN`, the degrees-per-radian constant, is also calculated in constants_init. (arl)

4.8. SIS Ice

Changes to ice_sis related to heat, water conservation. Now uses data_override. This requires a new version of sst_ice_clim.nc. All users should update their scripts to acquire the new data file. To get the new file, use

```
/home/fms/bin/get_fms_data -r inchon ggrpsst
```

In the RTS, use

```
<fmsDataSets> -r inchon ggrpsst </fmsDataSets>
```

(mw)

4.9. Coupler

Modified to support and reproduce answers with concurrent coupled models. Cross-ensemble parallelization checking tool is available. To use this tool, set the following namelist options of coupler_nml: `check_parallel=.true.`, `npes1, npes2`. When `concurrent=.true.`, also set `atm1_npes, atm2_npes, ocn1_npes, ocn2_npes`. (z1l)

4.10. SCM Atmospheric Model

The Single Column Model is included in Inchon. (sak)

4.11. "Null" Models

Null models are available for use when running certain component models in solo mode. (mh2)

- atmos_null
- land_null
- ocean_null

4.12. RTS: Regression Test Suite

The RTS is a tool to facilitate running FMS models. The user creates a model description file in xml format (or uses a preexisting file) and uses various rts-utilities on it. The rts-utilities, written in perl, can acquire code, create and submit compile scripts, and create and submit runscripts, among other things. Usage information for RTS is available at http://www.gfdl.gov/~arl/rts/. (arl)

4.13. FMS Datasets

Please use the following new or updated datasets with the Inchon code. (Run ~fms/bin/get_fms_data with no arguments for a help message.)